SIEMENS

MOBILETT Plus / - E/ - M

SP

Installation and Start-up Instructions

From serial-No.

MOBILETT Plus	2050
MOBILETT Plus E	10001
MOBILETT Plus M	20001

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Training of field service engineers

Due to the technology, used in this equipment, the setup, service and maintenance is only allowed to be performed by a field service engineer with a Work Permit for MOBILETT Plus.

Text emphasis

⚠WARNING	**“Warnings” are information provided with special emphasis when there is a potential for personal injury or life-threatening danger to the operator or patient.**
CAUTION	**“Cautions” are information provided with special emphasis when there is a potential for danger or damage to the equipment.**
NOTICE	**“Notices” are information provided with special emphasis to facilitate proper use of the equipment or proper execution of a procedure.**

Symbols

Checks and adjustments that must be performed with radiation ON are identified by the radiation warning symbol.

The symbol means "Dangerous voltage".

Checks marked with this symbol are to be entered into the test certificate at the end of these instructions.

The symbol means "Attention, consult the documentation".

This symbol means: equal to or less than.

U
S
A

Several of the sections in these instructions are for the USA only. These sections are identified with this symbol.

Sections marked with this symbol have been included in the Siemens Training Video (part of the self-study packet), which can be ordered through Siemens customer service.

Required documents

- Instructions for Use SPR8-220.201...
- Service Instructions SPR8-215.898...
- Installation Instruction SPR8-220.031.02...
  Remote exposure switch system-optional

USA
- Maintenance Instructions including DHHS... SPR8-215.831...

Required tools, measurement and auxiliary devices

NOTICE **All tools, measurement and auxiliary devices with the exception of those marked " * " , are listed along with their specifications in the ARTD (part 3).**

- Standard service equipment*
- Digital multimeter
- kV measurement device (works with the filter comparison method)
- Protective ground/earth meter
- Equivalent leakage current meter

USA
- Storage oscilloscope with ± 2.5 % accuracy

USA
- Dose meter

Safety information and protective measures

CAUTION

- **When performing service work and tests adhere to:**
  - **the product-specific safety information in the documents,**
  - **as well as the general safety information contained in ARTD Part 2.**
- **Connect the MOBILETT Plus/Plus E/Plus M only to line voltage (receptacle) , that corresponds to the installation requirements of VDE 0107 or country-specific regulations.**
- **Remove or install boards only when the generator is switched OFF. Adhere to the ESD guidelines.**
- **Checks and adjustments performed with radiation ON are identified by the radiation warning symbol ☢ . During these types of adjustments, radiation protective clothing must be worn.**

⚠WARNING

- **Never work with the system open if the capacitor is charging or has just charged.**
- **The capacitor bank may still be charged even if the system is switched OFF and the line voltage cable is disconnected. Life-threatening electric shock hazard exists.**
  To avoid danger, refer to the section entitled “Protective measures when working on the capacitor bank”.

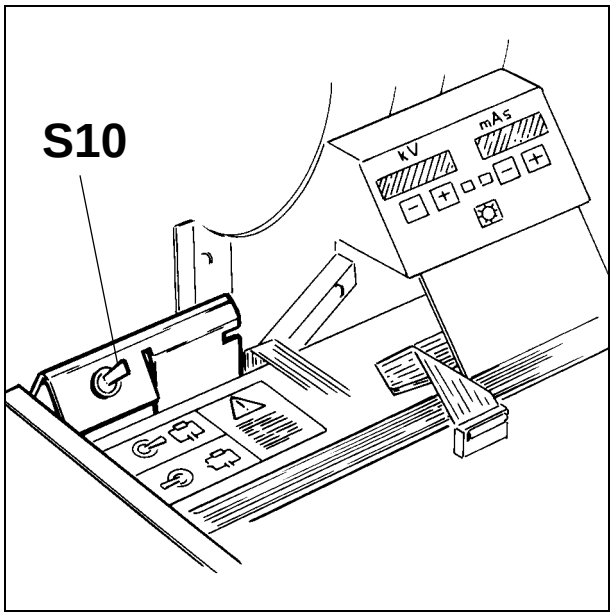

Fig. 1

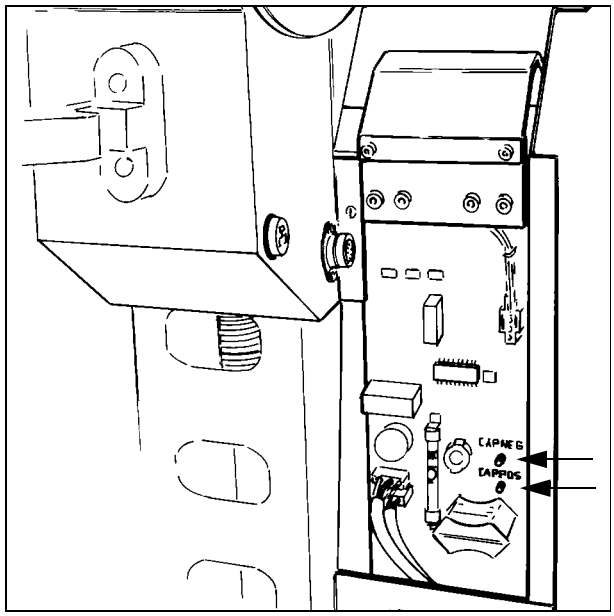

Fig. 2

Protective measures when working on the capacitor bank

Comply with the information given in this section, before opening the system.

⚠WARNING

Never work with the system open if the capacitor is charging or has just been charged.

The capacitor bank may still be charged even if the system is switched OFF and the line voltage cable is disconnected. Life-threatening electric shock hazard exists.

The capacitor bank must be considered charged until the protective measures listed in this section have been performed.

- Disconnect the mains/supply cable.
- Remove the system upper cover.
- Discharge the capacitor bank with S10 (D7) (refer to Fig. 1).
- Wait 5 minutes; then remove the left, right and front covers.
- Measure the residual voltage at test points CAPPOS and CAPNEG on board D7 (refer to Fig. 2). The voltage measured must be less than10 V.

⚠WARNING

If the voltage measured between CAPPOS and CAPNEG is 0V, the measurement device could be defective or the wires between the CAPPOS and CAPNEG test points on the capacitor bank could be damaged. In this case, proceed as follows:

- Make sure that the correct measurement range is set on the measurement device.
- Connect the measurement device to CAPPOS and CAPNEG.
- Switch S10 off. Connect the line voltage cable and switch the system ON.
- Check whether the voltage increases.
- Switch the system OFF, disconnect the line voltage cable and switch S10 on.
- Check whether the voltage decreases.

⚠WARNING

If the charging/discharging does not function, the capacitor bank must be considered “charged”. In this case, use the Service Instructions to guide you in troubleshooting.

Use caution when performing measurements at the bus bar of the capacitor bank. Use only the specified measurement devices (350 V DC).

General information

The MOBILETTs are mobile, mains-supplied X-ray units for intensive care units, neonathal departments and general X-ray rooms.

All exposure values can be chosen with free adjustment of kV and mAs data.

After start-up, country-specific tests are to be performed, if required;
e.g. acceptance test according to RöV (Germany-X-ray ordinance).

Acceptance test according to RöV (Germany):
Required measurements can be partially transferred from the test protocol provided.

Supply schedule

1 crate: L = 1360 mm
B = 780 mm
H = 1860 mm

Weight: gross approx	MOBILETT Plus	295 kg
	MOBILETT Plus E	283 kg
	MOBILETT Plus M	330 kg

(Technical documents enclosed)

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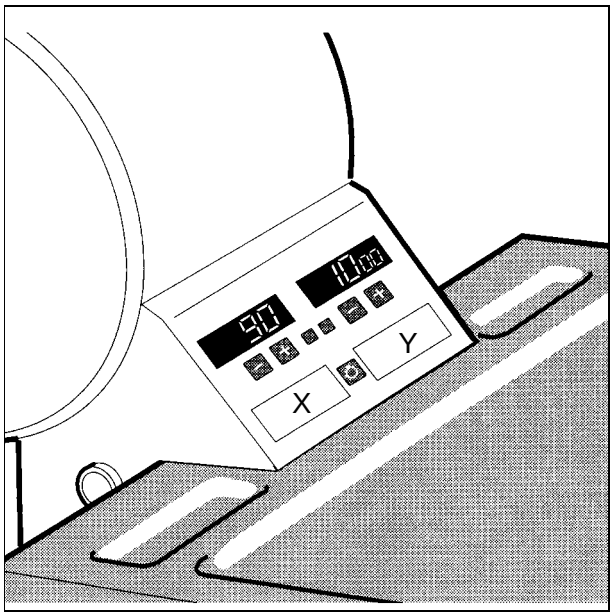


Fig. 1

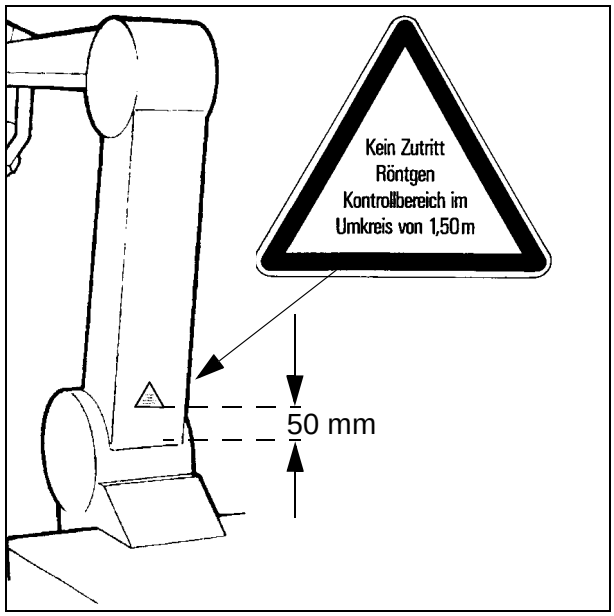


Fig. 2

Unpacking, applying warning labels

If a generator has been stored in a cold location, wait 2 - 3 hours before starting, in order to avoid damages due to humidity condensation. The single tank temperature must be >15°C before startup.

- Fill in the LINA cards and return them to the addresses stated in the instructions on the cards.
- Unpack the protractor.
- Connect the exposure release cable.
- Mount warning label 60 77 411. Choose appropriate language version and paste it/them on the control panel according to X, Y/fig. 1.
- Only in Germany:
  Mount label 96 33 645 on the lower arm 50 mm above the link, see Fig. 2.

If, due to increased operating loads (DIN 6815), there are other dimensions on site for the control range, appropriate labels can be ordered:
- Control range: 2.5 m, Part No. 84 14 823
- Control range: 3.5 m, Part No. 31 36 731

- Check the unit for cracks, fractures or other damages.
- Make sure that neither the single tank nor the collimator has any mechanical defects which would impair the radiation protection.

This unit is provided with a 110 V hospital grade plug or a 230 V European plug. If the unit will be operated with a different voltage, the plug can be exchanged for a local standard grounding/earthing plug. For USA and Canada an UL/CSA approved supply cable and plug is installed.

If the operating voltage is changed from 110 V to 230 V or vise versa, the mains fuses U9 and U10 must be exchanged;

110 V - 130 V = 15 A

200 V - 240 V = 10 A

Only use approved types of fuses, see Spare part list.

U S A

DHHS checks

The following measurements must be done according to "Maintenance Instructions including DHHS requirements".

- mAs accuracy
- Reproducibilty

Labels

See Operating Instructions for adequate labeling.

Formation status

Initialization and capacitor formation selftest

- Connect the power plug and switch on the mains switch.

  ➪ The MOBILETT runs a formation selftest during startup.

NOTICE	**If the formation status is OK, the "Ready" light indicator lights up in approximately 2 minutes. Continue with chapter "Function check".** **If error message "CAL 19" or "Err 17" appear on the display, see "Service instructions, section Capacitor formation".**

Function check

If a malfunction occurs a message is indicated at the display, see "Service Instructions, section Display messages".

Functional tests with motor drive (MOBILETT Plus M only)

1. Without the mains cable connected;

- Switch the start switch to I and check the battery indicator for at least half full.

  ➪ If not make step 3 and charge before continuing to step 2.

2. Test the forward and reverse controls.

NOTICE	**Speed adjustment, see Service Instructions.**

3. Switch start switch to 0, connect the mains and check that battery charge light is on.

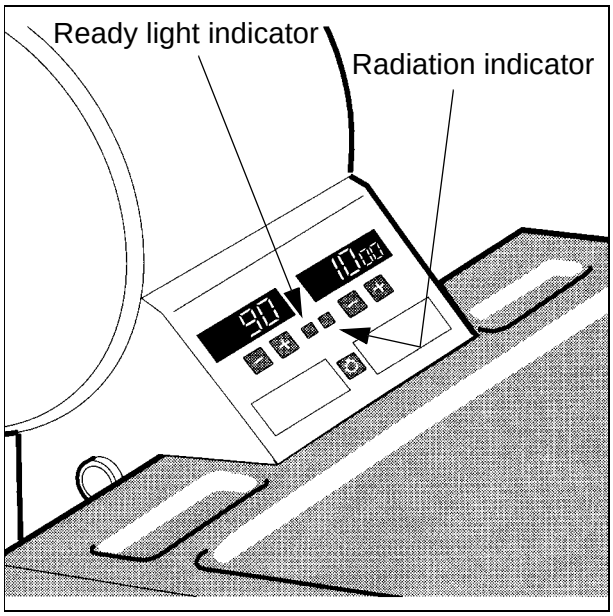


Fig. 3

Check the indicators and control buttons

- Check that the "Ready" light indicator lights green after approximately 2 minutes, see fig. 3. If the "Ready" light indicator is not lit, a display message is shown on the display. See " "Service Instructions, section Display messages"
- Select kV or mAs values by pressing the appropriate buttons. These values are indicated at the display. When changing the kV values, the "Ready" light indicator sometimes goes out while the generator adjusts to the new kV values.

NOTICE

Pressing the button briefly increases/decreases the exposure value by one step. Holding the button depressed results in a continuous increase/decrease.

Functional test cable winder (MOBILETT Plus/ Plus E with cable winder only)

- Disconnect the power plug.
- Pull the left brake handle (for the cable winder) upwards.
- Pull it down and up until the cable is completely rolled up.
- Connect the power plug.

kV and mAs indication, technique factors

- Confirm that the kV and mAs to be used during an exposure are indicated before the exposure begins and are visible from the operators position. Verify that all techniques factors are correctly indicated.

Radiation indicators

- Select 81 kV and 10 mAs.
- Make an exposure and confirm that the X-ray control console provides a visual indication whenever X-rays are produced and that a signal audible to the operator is present indicating that the exposure has been terminated.

Manual termination of exposure

The operator shall be able to terminate the exposure at any time during an exposure.

- Select:
  - MOBILETT Plus and Plus M; 55 kV, 160 mAs.
  - MOBILETT Plus E; 55 kV, 80mAs.
- Make an exposure and immediately interrupt the exposure with the exposure release switch. A message, "USE 20", appears on the display indicating that the exposure release switch was released during exposure. It will also be indicated by 10 short beeps. The message can be acknowledged by pressing the kV + button.

Remote exposure switch system (optional)

- Check the function of the remote exposure switch system according to chapter functional check of "Installation Instructions: Installation of remote exposure switch system".

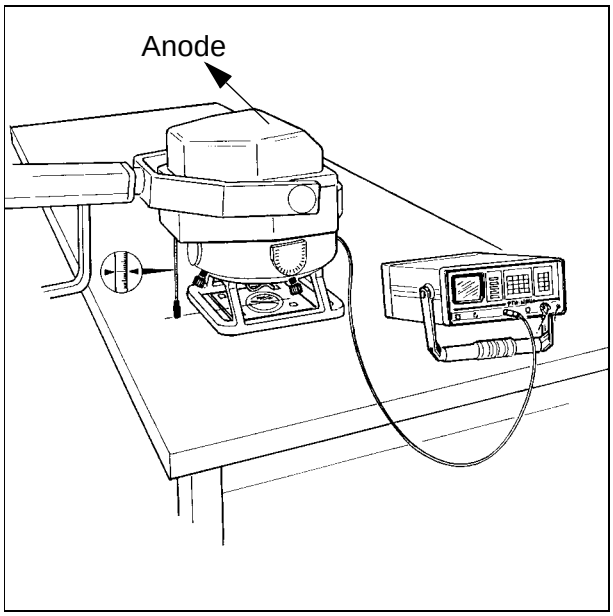


Fig. 4

Test of kV-accuracy

Requirement:

- The measured kV values, shall be within the limits stated in fig. 5.

Required measurement devices:

- kV-meter, based on the filter-comparison method, for example PTW-Nomex kV meter. When mesuring the kV non invasive a correction factor from the user manual of the kV-meter has to be used. If a kV meter is not available and if it is within local laws and regulations, the measurement can be made with an oszilloscope on D1. KVPEAK - D1 GND with a result of 40 kV/V.

NOTICE	**Higher filtration results in higher kV values.**

- For the actual filtration of this MOBILETT, see the test protocol.

If the actual inherent filtration is unknown, the correction shall be made with a reference value of 5 mm Al.

- Put the kV meter into operation, see operating instructions for the kV-meter.
- Place the measurement detector on a table or other. Using the light field, set the detector in the beam projection, see fig. 4.
- Set the SID to approx. 50 cm (20"). The SID may vary between different kV-meters.

- Set the following exposure parameters and release exposure:

kV Meter selection	Exposure parameter	Limit values* to be maintained
DC voltage	52 kV 50 mAs	49.0 - 55.0 kV
	81 kV 20 mAs	77.0 - 85.0 kV
	MOBILETT Plus/Plus M 133 kV 20 mAs	MOBILETT Plus/Plus M 126.4 - 139.6 kV
	MOBILETT Plus E 125 kV 20 mAs	MOBILETT Plus E 118.8 - 131.2 kV

Fig. 5

* The measurement inaccuracy of the respective measurement device must be subtracted from these limit values.

Adjustment

- To eliminate any deviations, see "Service Instructions section P10 - Fast adaptation",

Check the arm- and single tank movement

- Check the arm systems and the single tanks up and down movements. The arm and the single tank should be easy to move and remain in desired positions. If this is not the case, see "Service Instructions, section Adjustment of the friction linings".

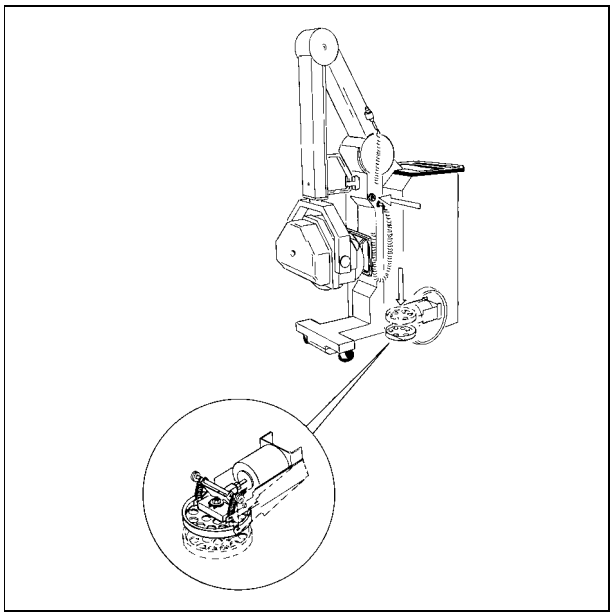


Fig. 6

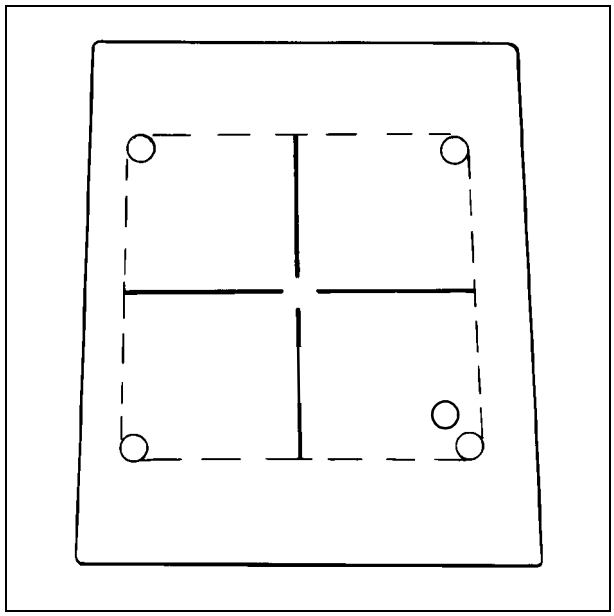


Fig. 7

Check the turn plate (MOBILETT Plus and Plus M only)

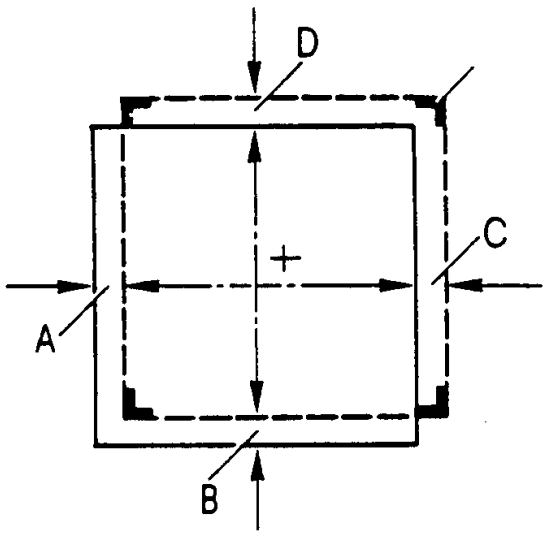
- Push one of the turn plate buttons. The buttons must be lit when the turn plate is activated.
- Check that the unit can rotate around the turn plate, see fig. 6.
- Push the turn plate button again and check that the turn plate goes back in parking position.
- Repeat the check with the other turn plate button. If any problem occurs, see "Service Instructions, section Adjustment and replacement of the turn plate".

Check the brake

- Lock the brake. It should not be possible to move the MOBILETT with normal hand effort. A slight skip is acceptable when using a force, greater than 350N.

Check the light field to x-ray field

- Load a 35x35 cm (14"x14") cassette with film.
- Put the cassette on a table or a similar repository.
- Set a SID of 100 cm (39") . Use the measuring tape.
- Switch on the light localizer and align the cassette. Now, collimate the light field to 25x25 cm (10"x10").
- Mark the four corners with coins and mark one of the corners with two coins, see fig. 7.
- Set 52 kV, 2.0 mAs on the control panel.
- Trigger an exposure.



$\frac{A+C}{SID} \leq 1{,}7\ \%$

$\frac{B+D}{SID} \leq 1{,}7\ \%$

- - - - - - - - = Light field

———— = X-ray field

SID = Source image distance

Fig. 8

- Process the film and measure the deviation between the light field and the X-ray field. Permissible deviation ±1.7 % of the SID, see fig. 8. If the deviation is greater, see "Service Instructions, section Exchange and repairs on the collimator".

Measurement of protective ground wire

Measuring instruments required: test instrument for protective ground wire

- Measure protective ground wire according to ARTD-002.731.17... "Safety regulations for installation and maintenance".

Resistance of protective ground wire ≤ 0.2 ohms.

Measurement of substitute leakage current

Measuring instruments required: test instrument for leakage current.

- Measure the substitute leakage current according to ARTD-002.731.17... "Safety regulations for installation and maintenance".

Value first measured

When the substitute leakage current is measured, a first measurement and so-called repeat measurements are carried out. It is the purpose of these repetitions to detect as early as possible any deviations from the value "first measured" and consequently changes in the safety structure of the system.

In the measurement of the first value, the **permissible maximum value of 2 mA** must not be exceeded.

The value "first measured" has to be entered in the test certificate at the end of the installation and setting instructions.

Repeat measurements

After a repair - if this becomes necessary due to the work performed - and basically always after maintenance, the substitute leakage current has to be measured again.

The value measured must not exceed the permissible maximum value of 2 mA. In addition, the value first measured must not be exceeded by more than 50%.

The results have to be documented.

List of compatible components

Component	Part No.
Single tank (new)	60 77 379 X037E
Single tank (repaired)	61 85 172 X037E
Collimator (new)	63 17 775 X037E

Changes to previous version

Page:	Change:
2 - 1	Additional labels added
2 - 3	Cable winder added
2 - 4	Remote exposure switch added

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Test certificate, MOBILETT Plus / Plus E / Plus M 3 - 1

This test certificate is subdivided by analogy to installation and adjustment instruction. This test certificate shall be completed in duplicate, one copy remaining with the client, the other to be filed at the branch office.

Part No./Type No./Serial No.: .....

Customer: ..... **Customer No:** .....

Site/System Designation: .....

- ☐ Unpacking, Warning labels
- ☐ Labels
- ☐ Initialization selftest
- ☐ Capacitor formation
  (Formation program used)
- ☐ Functional tests with motor drive
  (MOBILETT Plus M only)
- ☐ Functional test cable winder
  (MOBILETT Plus / Plus E with cable winder only)
- ☐ Check the indicators and control buttons
- ☐ kV and mAs indicaton, technique factors
- ☐ Radiation Indicators
- ☐ Manual termination of exposure
- ☐ Remote exposure switch system (optional)
- ☐ Test of kV-accuracy

	Exposure values	**Measured kV**
	52 kV / 50 mAs	.....
	81 kV / 20 mAs	.....
Plus/Plus M	133 kV / 20 mAs	.....
Plus E	125 kV / 20 mAs	.....

Measurement device
Type: .....
Serial No.: .....
Date calibrated: .....

USA

- ☐ Test of mAs-accuracy

	Exposure values	**Calculated mAs**
	40 kV / 5 mAs	.....
	81 kV / 2 mAs	.....
Plus/Plus M	133 kV / 10 mAs	.....
Plus E	125 kV / 10 mAs	.....

Measurement device
Type: .....
Serial No.: .....
Date calibrated: .....

USA

☐ Check for reproducibility

Fluctuation coefficient C: .....

Measurement device

Type: .....

Serial No.: .....

Date calibrated: .....

☐ Check the arm- and single tank movement

☐ Check the turn plate (MOBILETT Plus and Plus M only)

☐ Check the brake

☐ Light field relative to the x-ray field

$\frac{(A+C)x100\%}{SID}$ = ... %

$\frac{(B+D)x100\%}{SID}$ = ... %

☐ Protective ground: ..... Ω

Measurement device

Type: .....

Serial No.: .....

Date calibrated: .....

☐ Substitute leakage current: ..... mA

Measurement device

Type: .....

Serial No.: .....

Date calibrated: .....

Date: ..... Technician: .....